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ABSTRACT

This module, concerned with measurement, provides a series of 12 worksheets that allow students to: compare their ability to walk and run to their physical attributes, play a game that involves various senses and measurements, and be grouped by various means and then compare the groups with certain measurements. Teaching suggestions are provided. (MK)

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ENVIRONMENTAL MODULE FOR USE IN A MATHEMATICS LABORATORY SETTING

People Patterns - MEASUREMENT

by

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People Patterns - MEASUREMENT

This module may be used in many ways.

1. It may be used activity-by-activity until the entire module has been completed.
2. It may be used with each activity as a separate unit.
3. It may be used to supplement other units.

Materials

Contained in this module:

1. Student Worksheets #1 to 12

Teacher must provide:

1. Meter sticks
2. Wastebasket
3. Tape
4. Adding machine tape (or paper)
5. Watch (with second hand)
6. Baseball
7. Balloons.

Optional (teacher provides):

1. Stopwatch
2. Pedometer.

OBJECTIVES

.Given a distance between 5 to 25 meters, a student will be able to estimate the actual length of that distance within 10% error.

.Given objects 1 centimeter to 1 meter long, students will be able to estimate lengths within 10% error.

.Given a meter stick, students will be able to measure any length from 1 millimeter to 100 meters.

.Given linear statistics, students will be able to convert statistics to a graph.

OVERVIEW

The module has activities grouped together in the following ways:

In Student Worksheets #1 to 3, students compare their ability to walk and run to their physical attributes.

In Student Worksheets #4 to 9, students play a game, "Pentathalon", that involves various senses and measurements.

In Student Worksheets #10 to 12, students are grouped by various means and the groups are compared with certain measurements.

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I. Student Worksheets #1, 2, and 3

A. Materials provided:

1. Student Worksheets #1, 2, and 3.

B. Materials needed:

1. Meter sticks
2. Pedometer (optional)

C. Work to be completed by students:

1. Student Worksheets #1, 2, and 3
2. Students should be able to compare results and make some decisions relating to physical size and ability.

D. Teaching suggestions:

1. You may want to group students and have the groups share results.
2. You may want to have the students pick a teacher in the building who walks a lot, or compare which teachers walk the most - and why.

II. Student Worksheets #4 to 9

A. Materials provided:

1. Student Worksheets #4 to 9

B. Materials needed:

1. Wastebasket
2. Tape
3. Meter stick
4. Watch (with second hand)
5. Stopwatch (optional)

C. Work to be completed by the students:

1. The game "Pentathalon", Student Worksheets #4 to 9

D. Teaching suggestions:

1. You may want to have the activities spread out over a week, with one activity each day.

2. You may want to analyse why one person or type of person would have a tendency to score more points on each event.

III. Student Worksheets #10, 11, and 12

A. Materials provided:

1. Student Worksheets #10, 11, and 12

B. Materials needed:

1. Watch (with second hand)
2. Stopwatch (optional)
3. Meter stick
4. Ball
5. Balloons (same size and shape)

C. Work to be completed by the students:

1. Student Worksheets #10, 11, and 12

D. Teaching suggestions:

1. You may want to compare lung capacities (Student Worksheet #12) between smokers and non-smokers.

2. You may want to use these activities over several weeks, when the weather is warm, to get them out of the classroom.

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Going Places

How far do you walk each day? Can you estimate how far? You may be able to analyze the distance you walked by figuring out every place you walked to and from yesterday. You can estimate the distances and arrive at your total distance.

What's the length of your step?

Take a sample of different people's steps. What is the average? Does this average differ for guys and gals?

Tomorrow try to become more aware of how far you walk -- it may surprise you.

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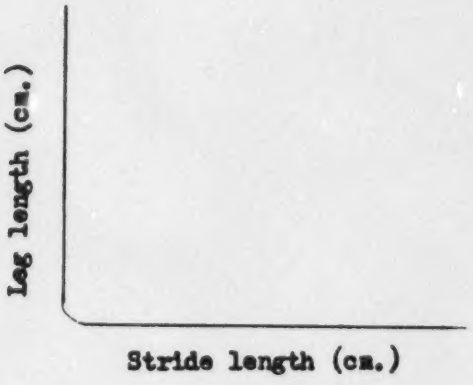
Leg It - Walk, Don't Run

Measure the length of stride used in normal walking for each classmate. Next, measure the length of the person's legs. Do long-legged people have the longest walking stride?

Can you graph leg length and stride length?



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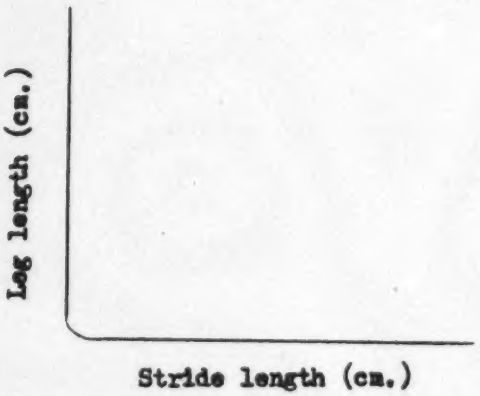
Leg It - Run, Don't Walk

Measure the length of stride used in hard running for each classmate. Now, measure the length of the person's legs. Do long-legged people have the longest running stride?

Can you graph leg length and stride length?



What other factors, besides leg length, affect running stride length?

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Pentathalon

A pentathalon is a contest involving five events. A score is kept for each event. The person with the highest total score is the winner. A maximum of 1,000 points may be scored for each event; the highest possible total, therefore, is 5,000 points.

The five events in this pentathalon are: paper throwing, high jumping, grasper faster, penney flip and beat-the-clock.

Score Sheet

Event	Points
Paper Throw	
High Jump	
Grasper Faster	
Cents Able Flip	
Beat-the-Clock	
Total	

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Pentathalon - Paper Throw

This event will require 10 paper wads and a wastebasket. Mark a free-throw line on the floor with a piece of tape. Place the wastebasket eight meters from the line.

You will have 10 throws. You score 100 points for each "basket" made; the paper wad must land in the basket.

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Pentathalon - High Jump

You will be measuring how high you can jump. To do this, you will need some adding machine tape (or a strip of paper several meters long), a pencil and a meter stick. Tape the paper to the wall so that when you stand with your arm raised, your fingers touch the paper, and when you jump, your fingers still touch the paper. Blacken an area on a piece of paper with a pencil. Rub the fingers of one hand across the blackened area. Stand next to the paper-taped wall and, while flat-footed, press your fingers on the paper to make a print as high as you can reach.

Now we begin the contest! Jump up and touch the paper with your fingers at the highest point of your jump. Measure the distance between the two sets of prints. You get one point for each millimeter of length you jumped.

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Pentathalon - Grasper Faster Is the Rule

Rest the heel of your hand on the edge of the desk with the finger and thumb extended over the edge of the desk. A friend holds a meter stick vertically such that the lower end of the meter stick is at the level of your finger and thumb. Without warning, your friend drops the meter stick. You must pinch the meter stick between your thumb and index finger as quickly as you can.

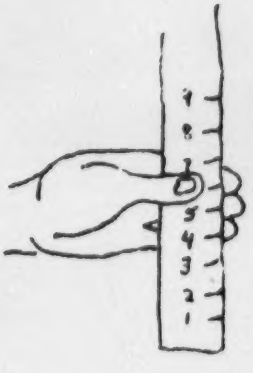
Use the table on the following page to find your reaction time.

To score points, take three trials and use the best reaction from the three trials. Remove the decimal point from your best reaction time. Multiply this by 2 and subtract from 1000.

For example: Your best time is 0.157. This would be

$$\begin{array}{r} 157 \\ \times\ 2 \\ \hline 314 \end{array} \qquad \begin{array}{r} 1000 \\ -\ 314 \\ \hline 686 \end{array}$$

You have 686 points for this event.



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Reaction Table	
Distance in Cm.	Time in Seconds
1	0.026
2	0.052
3	0.074
4	0.090
5	0.102
6	0.110
7	0.119
8	0.127
9	0.136
10	0.144
11	0.150
12	0.157
13	0.163
14	0.170
15	0.176
16	0.182
17	0.187
18	0.193
19	0.198
20	0.204
21	0.208
22	0.212
23	0.216
24	0.220
25	0.225
26	0.229
27	0.234
28	0.238
29	0.242
30	0.246
31	0.250
32	0.254
33	0.258
34	0.262
35	0.266
36	0.269
37	0.273
38	0.276
39	0.279
40	0.281

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Pentathalon - Cents Able Flip

We will be working with the skill of penny tossing. You will need some tape, a penny, and a meter stick.

Place two pieces of tape on the floor 4 meters apart. You will stand behind one piece of tape (the free-throw line), toss a penny to the other piece of tape (the goal), trying to get the penny as close as possible to the goal. Measure the distance from the goal to the penny.

You will have five throws. Take the best throw, measured in millimeters, and subtract that distance from 1000 to get the number of points you earned for this event. For example:

If you tossed the penny 25 mm from the goal, your points would be 1000 - 25 mm, or 975 points.

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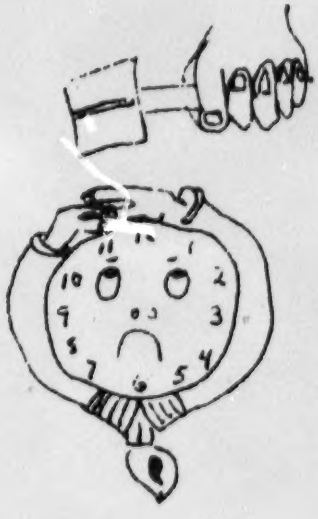
Pentathalon - Beat-the-Clock

This activity will require the aid of several other students. You will have to guess when an interval of two minutes is over. You need one student to let you know when time has begun and to keep track of when you tell him to stop. The other student(s) are to try to distract you from counting in your head. They will try to keep you talking and answering questions.

Your score will be found by multiplying each second, over or under the two minutes time limit, by 20. Then subtract this answer from 1000. For example: Suppose you stopped at two minutes and fifteen seconds - you are fifteen seconds over. 15 x 20 = 300; 1000 - 300 = 700. You would score 700 points for this event.



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Skip 'Til I'm Blue

You will need a football field, track or a large open area. Measure a distance of 25 meters, marking the start of the 25 meters and the finish.

Each person will be timed walking the 25 meters, running the 25 meters, hopping the 25 meters and skipping the 25 meters. Perform each of the activities (walking, running, hopping and skipping) from a moving start, then from a standing start. Graph your results for both the moving start and standing start.

If a person runs the 25 meters in five seconds, is it true that he will run 50 meters in ten seconds? 75 meters in fifteen seconds? 100 meters in twenty seconds? 400 meters in eighty seconds?

How about walking, hopping, and skipping -- would that pattern work for these events?

You may wish to perform each experiment again at 50, 75, 100, and 400 meters, then graph the results.

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Don't Let It Throw You

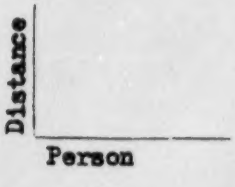
Group the people in your class by height (the groups could consist of people who are 5 cm. different in height). Take each group out to a large playing area. Each person will throw a ball as far as they can. Measure the distances. Are these distances consistent within each group?

Next, group the people by sex and repeat the experiment. Are the distances consistent in these groups?

How else might you group them? weight? hair color?

You may wish to graph the results of each grouping.

Grouping: _____



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Bag of Wind

You will need a balloon for each person; all of the balloons should be the same size and shape. Each person has different lung capacities. People in good physical condition usually have large lung capacities.

Each person will blow up their balloon as much as they can, using one breath. How could you estimate the volume of each person's balloon?

Compare the results of different groups. Maybe athletes, heights, weights or sex could be a source of grouping.

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